



Screening bermudagrass accessions for shade and drought tolerance

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Introduction



Bermudagrass is a popular warm-season turfgrass for golf courses, athletic fields, home lawns, and public areas. It has aggressive growth and a dense, deep-rooted canopy with good traffic tolerance. However, it has the lowest levels of shade tolerance among warm-season turfgrasses.



Shade tolerance is a desirable trait for the turfgrass industry because of the ubiquitous presence of trees in landscapes. When direct sunlight exposure is decreased to 4-5 hours per day, turfgrasses are negatively affected within the first four to seven days, causing morphological and physiological changes.



Another important trait that limits bermudagrass growth is drought. This trait is of economic importance because of water conservation, mainly during hot summers when plant evapotranspiration increases. Likewise, production of quality turfgrass under limited irrigation conditions will enhance the expansion of bermudagrass to arid zones.

Background

- In 2014, nine South African accessions of common bermudagrass were evaluated under 0%, 63% and 80% shade.
- Two accessions, 'WIN10F' and 'STIL03', showed consistent NDVI, turfgrass quality, and turfgrass cover in both years of evaluation, with responses comparable to that of shade tolerant control Celebration.



Objective:

Evaluate 24 common bermudagrass (*Cynodon dactylon* (L.) Pers.) accessions collected from South Africa for their ability to persist under shade and drought

Materials & Methods

Plant Materials

- 24 newly collected South African accessions
- Shade tolerant controls: WIN10F, STIL03 and cultivars Celebration and TifGrand
- Shade susceptible controls: Tifway and TifTuf

Locations

- Shade: The Lake Wheeler Turfgrass Field Lab (Raleigh, NC)
- Drought: Sandhills Research Station (Jackson Springs, NC)

Maintenance

- One time fertilization for establishment in year 1 at 48.8 kg nitrogen ha-1
- Mowing height: 2.75 inches.
- Minimal-to-no pest control or supplemental irrigation.
- Shade cloth (63%) was placed on 8/21/20

Response Variables Evaluated

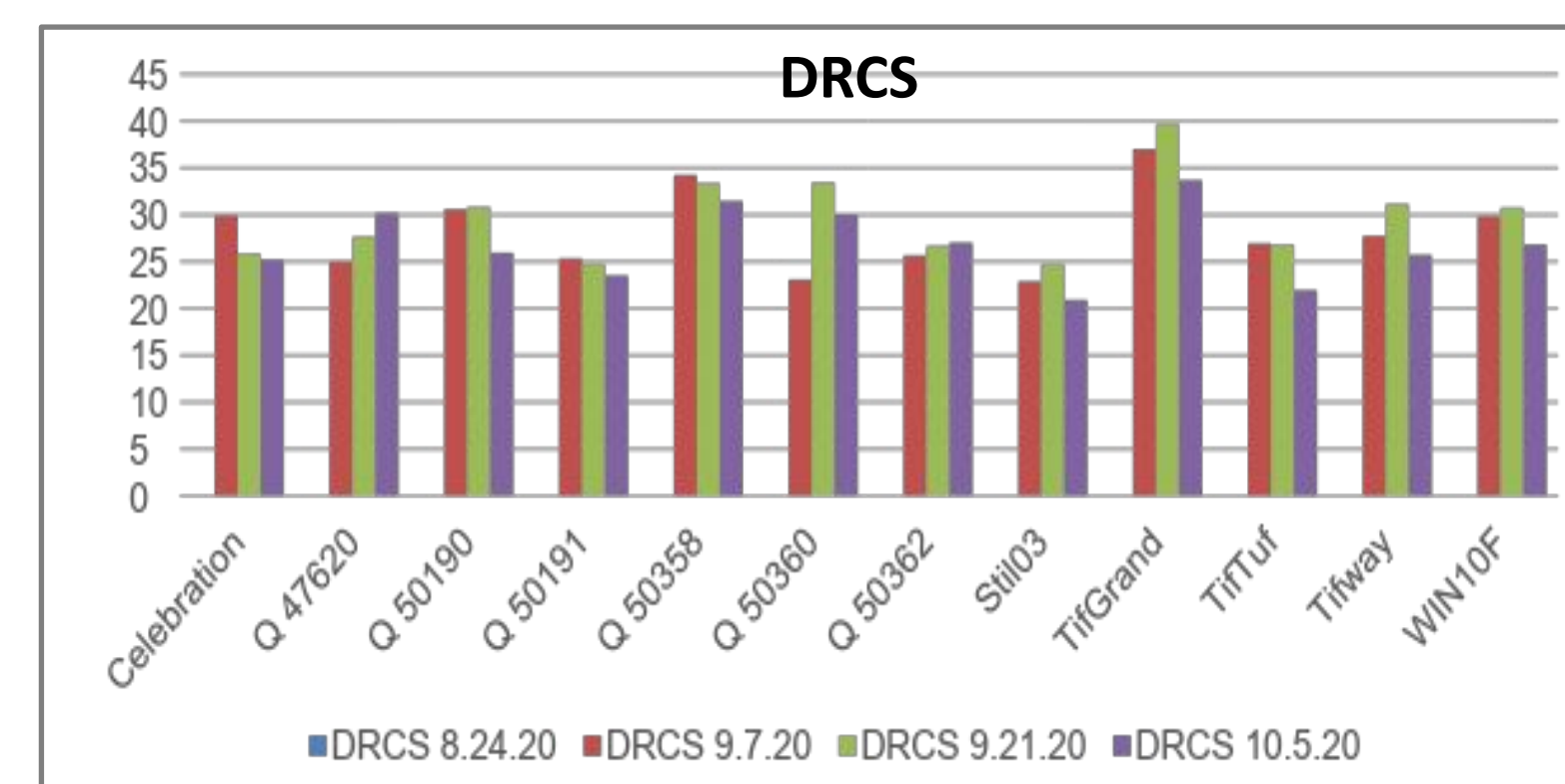
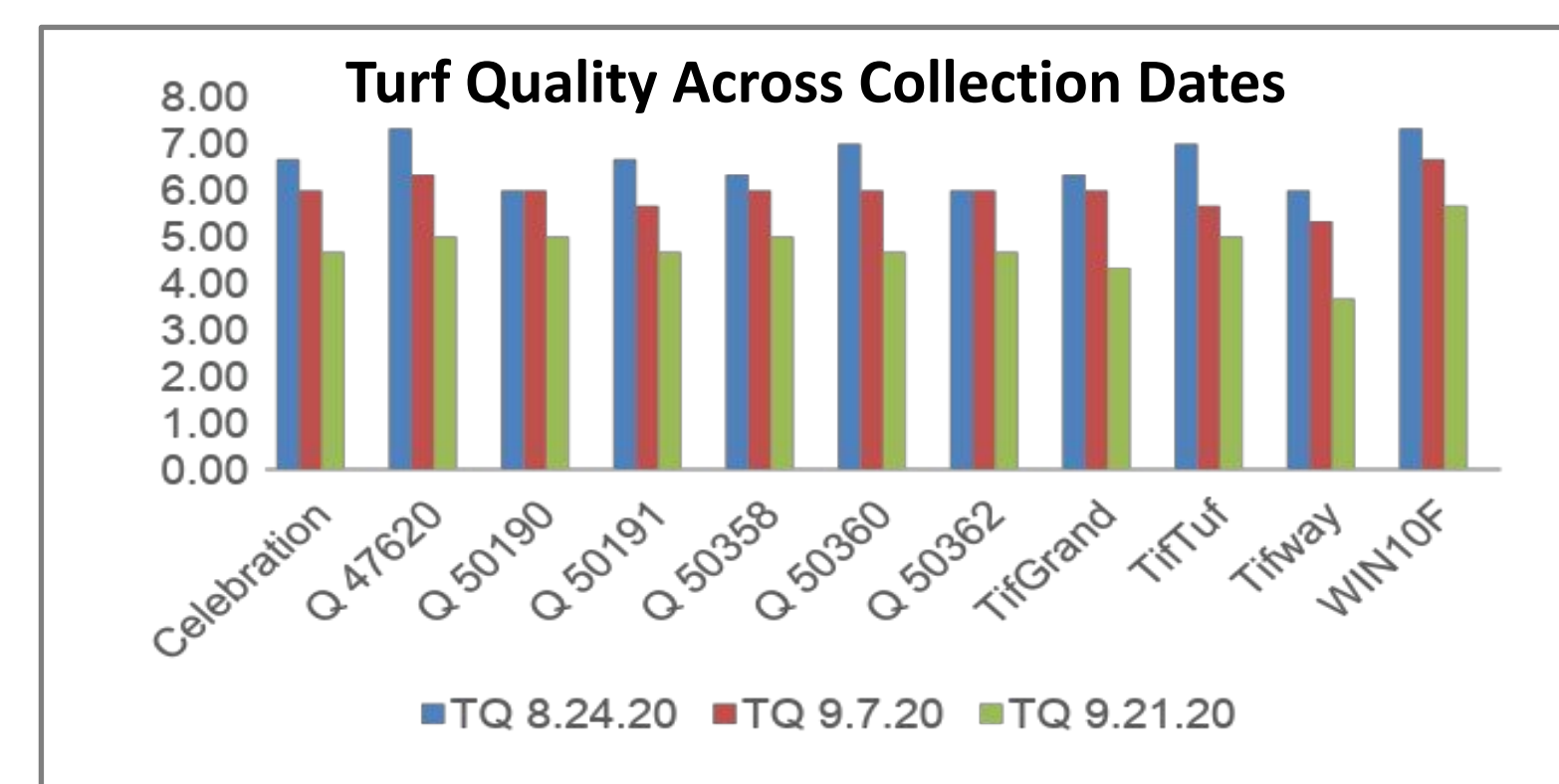
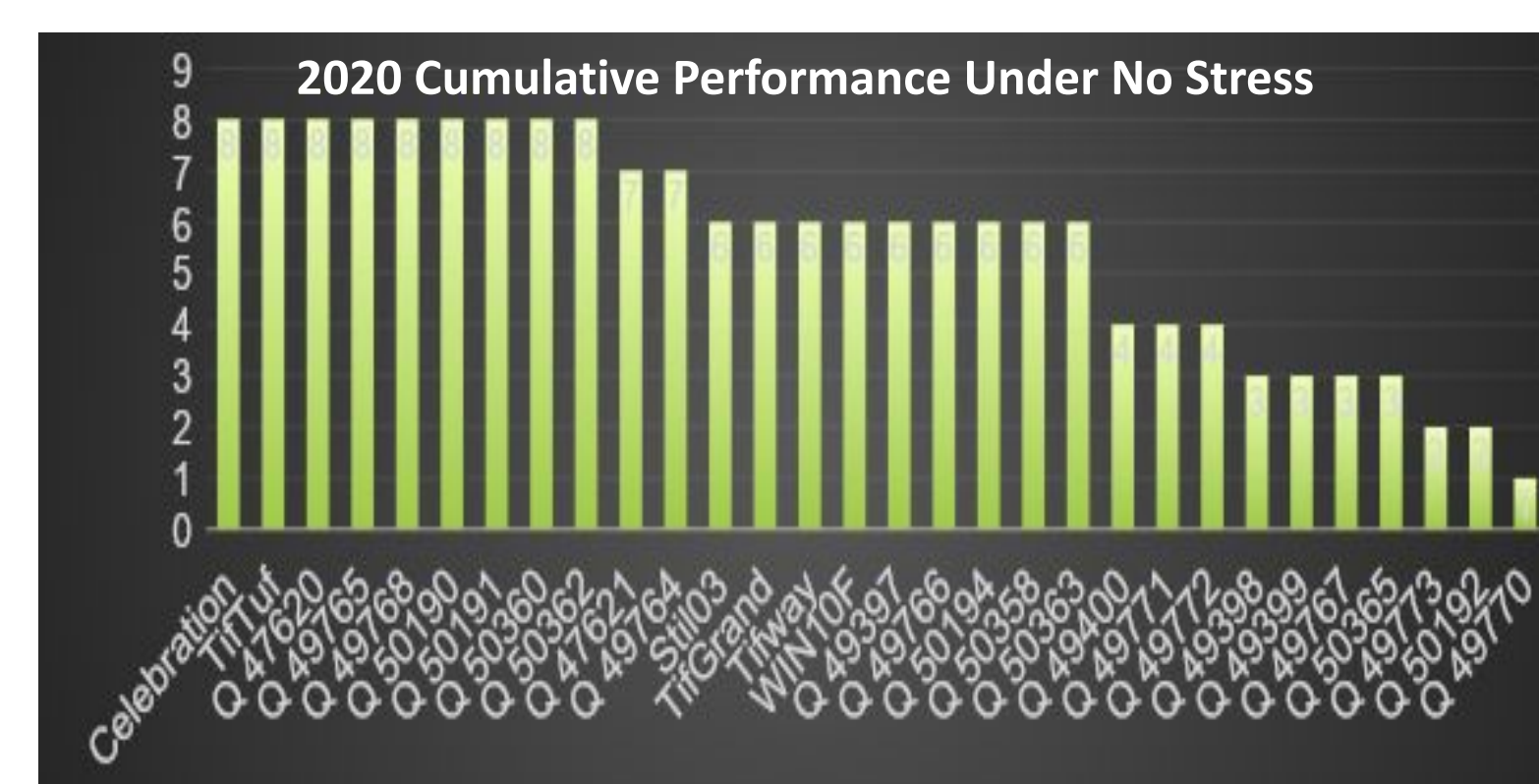
Variable	Location
Establishment (Est)	LW, SH
Winterkill (WK)	LW, SH
Turf quality (TQ)	LW, SH
Turf density (TD)	LW, SH
Leaf texture (LT)	LW, SH
Genetic color (GC)	LW, SH
Turf uniformity (TU)	LW, SH
Fall color (FC)	LW, SH
% living ground cover (GC)	LW, SH
Turf quality under drought (TQD)	SH
Turf quality under shade (TQS)	LW
Density under shade (DS)	LW
Genetic color under shade (GCS)	LW
NDVI under shade (NDVI)	LW
Digital ground cover under shade (DGCS)	LW
Digital regrowth under shade (DRCS)	LW

LW= Lake Wheeler, SH = Sandhills

Digital imaging



Lake Wheeler Shade Trial

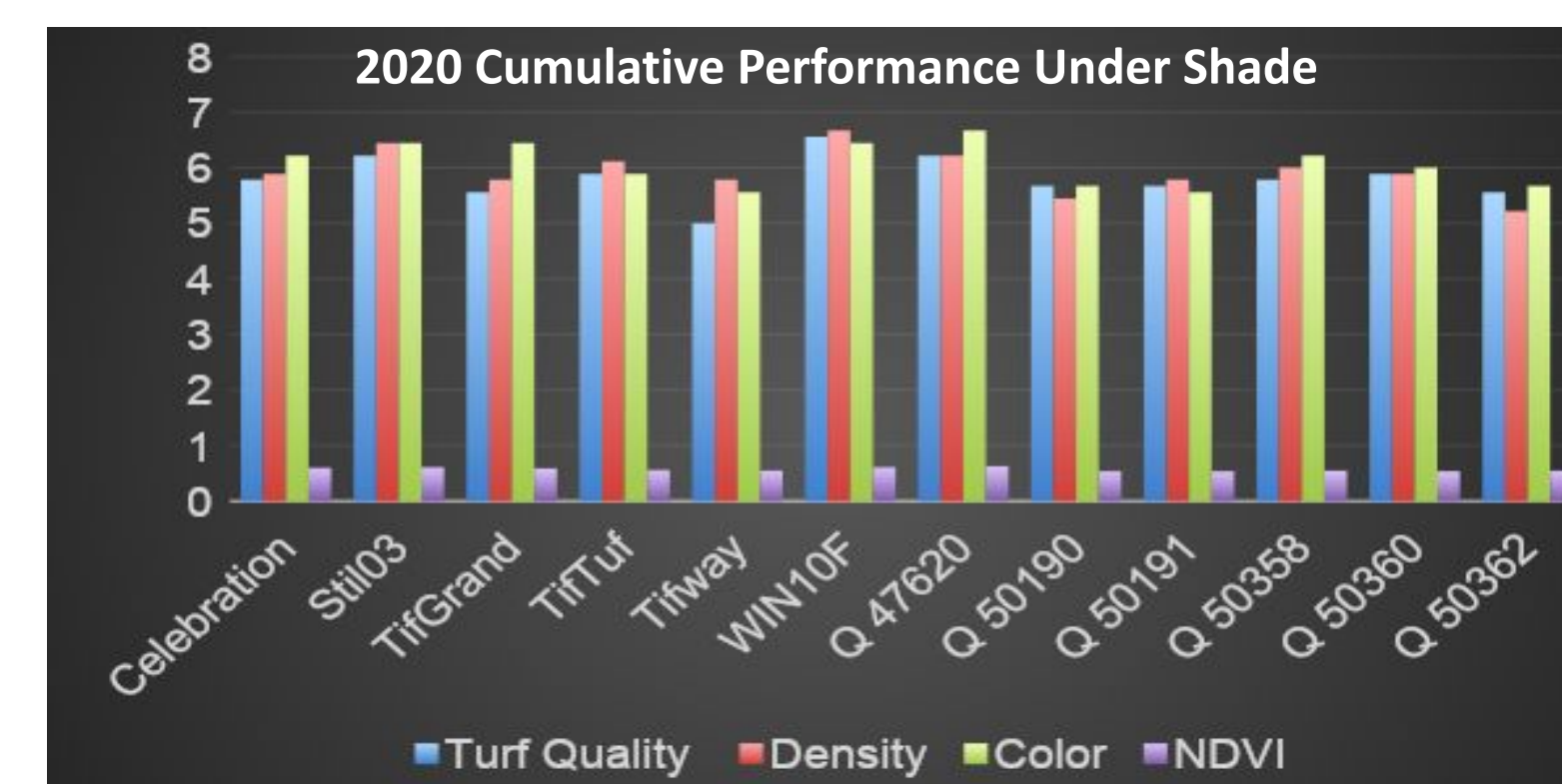
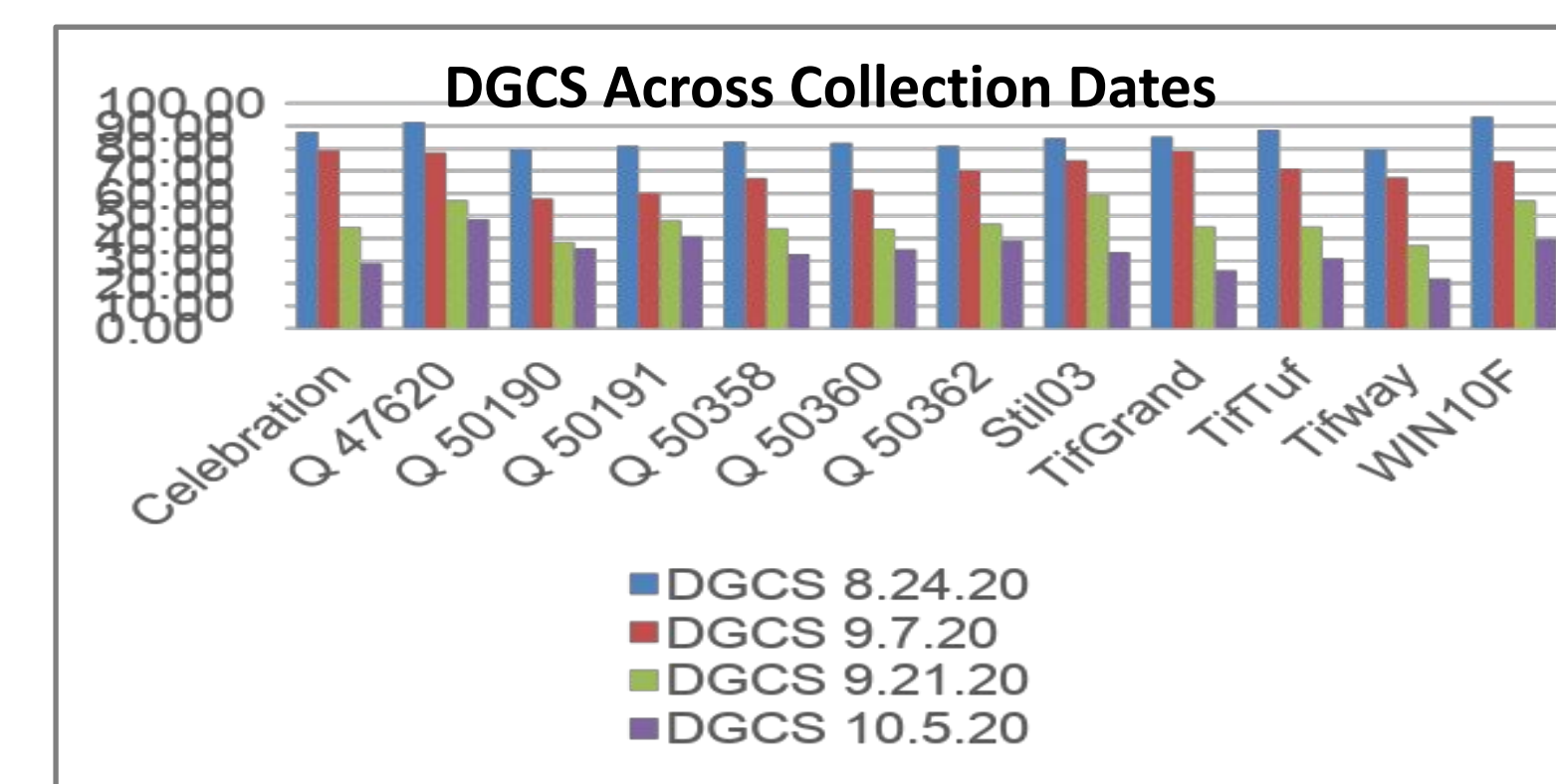
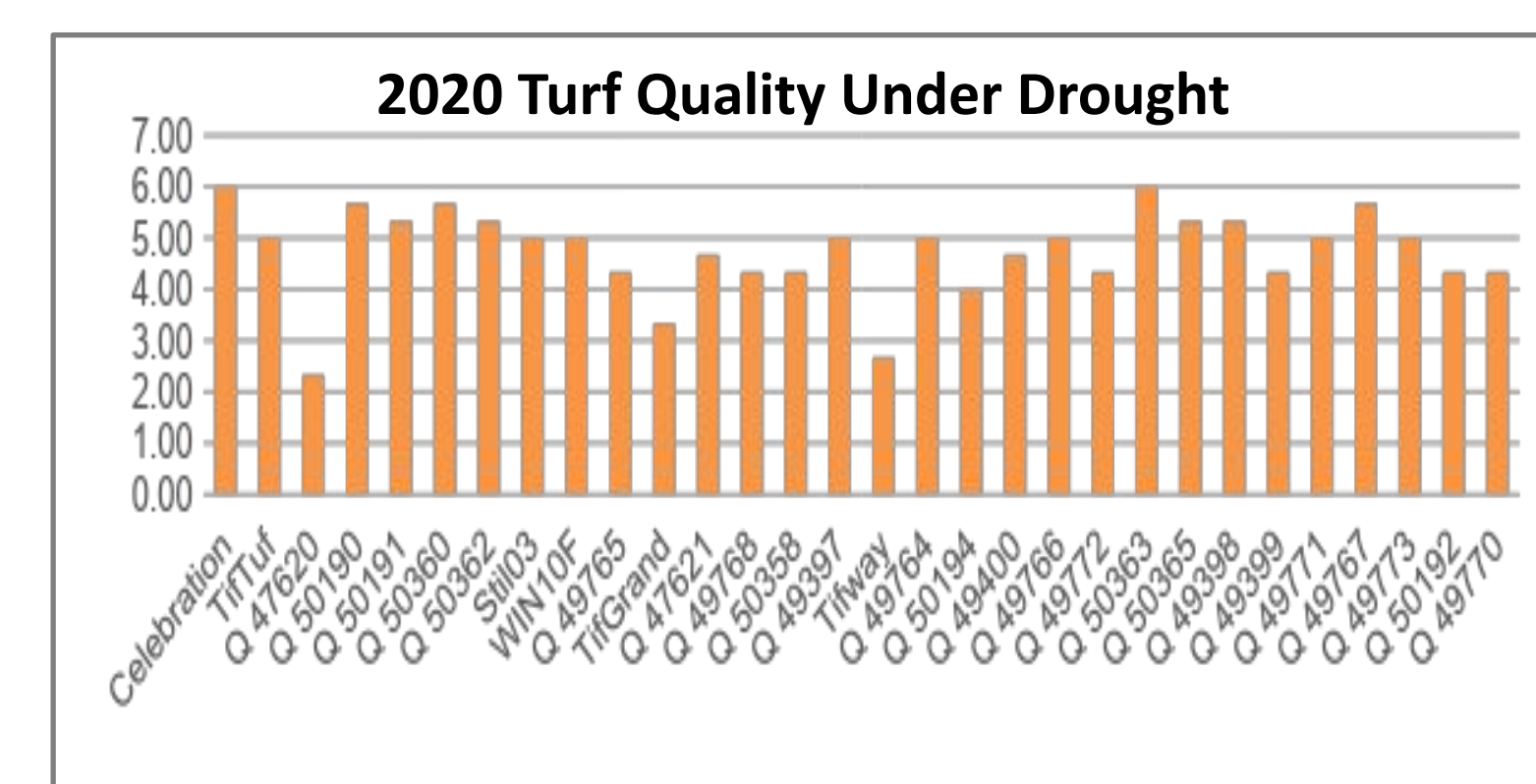


Results

Regrowth under Shade



Sandhills Drought Trial



Under no stress

- Significant differences (P=0.05) were found among genotypes for all variables but uniformity.

- TifTuf ranked as the most aggressive line, but genotypes WIN 10F, Still 03, Q 50362, Q 50358, Q 50360 and Celebration were not significantly different. Tifway ranked as the least aggressive line in this study.

- Lines Q 50191, Q 47621, Q 50190, Q 49397 and Q 50358 were comparable to TifTuf, Celebration and Tifway but statistically superior to Still 03, WIN 10F and TifGrand when comparing Winterkill.

- For TQ, TifTuf and TifGrand were the top performers followed by genotypes Q 50360, Still 03, Q 50190, WIN 10F and Q 50191.

Under drought stress

- Evaluated genotypes showed significant differences in TQD. Celebration and Q 50363 had the best performance for this trait. TifGrand, Tifway and Q 47620 showed the least tolerance to drought stress.

Under shade stress

- In the combined analysis across dates of evaluation, Stil03, Q47620, TifGrand, WIN10F, Celebration, and TifTuf were in the top group of performance.

- However, some lines were identified as top performers for individual traits: WIN10F for TQS and DS; Stil03, Q47620, TifGrand and WIN10F for DGCS; accession Q47620 for NDVI and TifGrand for DRGS.

- Tifway ranked as the least shade tolerant cultivar and Q49770 as the least shade tolerant accession in the trial

Ongoing Work

- Evaluations of both trials continued through 2021.
- Data was collected on shade from June to October.
- Drought tolerance data was collected visually and also using an unmanned aerial vehicle (UAV) after 14 days with no rain in August.
- Data from both years will be analyzed and results will be presented in 2022.

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